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Dr. Walter Polansky
U.S. Department of Energy
Washington D.C.

Dear Dr. Polansky:

As you are aware, Dr. Noninski recently spent a week at BNL as a guest of Dr. McBreen and myself. The purpose of the visit was to demonstrate a thermo-electrochemical effect originally described by Dr. Randy Mills of Lancaster, Pennsylvania. As per your request, this is a short review of what I observed. I am not making any inference as to the impressions, observations, or conclusions drawn by Dr. McBreen.

The experiment can be briefly described as follows. A well insulated dewar was filled with a ~0.7M solution of potassium carbonate and distilled water. A nickel cathode and platinum anode were immersed in the solution along with a resistor and thermistor. The dewar was covered and became, in essence, a heat flow calorimeter. A known amount of power was applied to the resistor and the temperature of the dewar was increased until equilibrium was reached, typically 24 hours. The temperature rise in the dewar, ΔT, was divided by the power dissipated in the resistor yielding a slope with units of °C/Watt. The resistor power was terminated and the dewar was allowed to cool down. A voltage was next applied across the platinum anode and the nickel cathode. The solution was electrolysed with hydrogen being liberated at the cathode and oxygen at the anode. The temperature of the dewar again increased and reached equilibrium after ~24 hours. The temperature of the dewar increased because some of the applied electrolysis power was dissipated in the cell. The temperature rise of the dewar, ΔT, is divided by the electrolysis power dissipated in the dewar yielding a slope with units of °C/Watt, as was done for the resistor. To correct for the evolution of gasses in the dewar the thermoneutral voltage, 1.48 Volts, was subtracted from the applied voltage, V. The electrolysis power dissipated in the dewar was obtained by multiplying the corrected voltage, V - 1.48V, by the electrolysis current.

The claim is as follows. The temperature rise in the dewar is greater in the case of electrolysis as compared to using a resistor, even though the dissipated power is equal in both cases. According to Dr. Mills' theory, this apparent "excess power" is due to the fact that the electron in a hydrogen atom can "decay" to stable subinteger quantum levels.

Dr. Noninski demonstrated this thermal effect at BNL. Before proceeding further a few comments are in order. I did not check the calibration of his equipment nor did I observe his experimental technique in great detail. The time was not available to me. There were no obvious errors and as the effect has been claimed by Dr. Mills and Dr. Noninski for some

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time, I feel it is probably correct. What was typically observed is as follows. For a dissipated power through the resistor of 0.1 Watt a dewar temperature rise of 3°C was measured. The slope, as previously defined, was therefore 30°C/Watt. If the electrolysis power dissipated in the dewar was say 0.5 Watts, a temperature rise of 3°C was observed giving a slope of 60°C/Watt. The question is, why does the power dissipated in the dewar, when applied electrolytically, give a larger temperature rise as compared to a resistor? One possibility is that the evolving gasses are recombining in the dewar. Dr. Noninski checked this by measuring the Faraday efficiency of the electrolysis in a separate experiment. There appeared to be little gaseous recombination. I must emphasize that the quantity of gasses evolving from the dewar were not measured. Gaseous recombination in the dewar was not, therefore, unequivocally ruled out. Another possibility is that there is a chemical reaction occurring. For example can potassium carbonate be catalytically decomposed into say potassium hydroxide? Finally, the process of electrolysis infuses the solution with fine bubbles. These bubbles would be expected to change the thermal characteristics of the calorimeter. I discussed this with Dr. Noninski and he produced some experimental results from the literature indicating that the bubbles should have decreased the measured value of the slope and not increase it (as compared to a resistor).

In summary, there appears to be an unusual thermal effect (at very low power levels) which occurs during the electrolysis of potassium carbonate solutions. The presence of "excess power" has not, however, been demonstrated much less "proved". A number of basic experiments need to be performed to eliminate some of the possibilities previously outlined. Finally, there are probably many other possible explanations for explaining this thermal anomaly and these would, of course, also need to be investigated.

Sincerely,

Harold Wiesmann
Materials Science Division

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